

We claim:

1. A method for predicting properties of a composite sedimentary body in a subsurface reservoir, comprising:
 - 5 (a) determining at least a partial outline of the composite sedimentary body;
 - (b) characterizing properties of fundamental bodies in the composite sedimentary body;
 - 10 (c) generating a fundamental body based on the characterized properties of the fundamental bodies;
 - (d) placing the fundamental body into the partial outline of the composite sedimentary body;
 - (e) repeating steps (c) through (d) until the partial outline of the composite sedimentary body is substantially full of fundamental bodies.
- 15 2. The method of claim 1, wherein the properties of the fundamental bodies are characterized by a method chosen from the group consisting of: determining local inlet properties of flows which built the fundamental bodies, determining trends in the local inlet properties of the flows which built the fundamental bodies, determining statistical distributions of the local inlet properties of the flows which built the fundamental bodies, and any combination thereof.
- 20 3. The method of claim 2, wherein the local inlet properties are chosen from the group consisting of: flow velocity at an inlet, flow height at the inlet, suspended sediment volume within at least one grain size range at the inlet, inlet width, flow duration, inlet location, order in which the inlet is active relative to local inlets of other fundamental bodies, and any combination thereof.

4. The method of claim 1, wherein the properties of the fundamental bodies comprise at least one member of the group: shapes of the fundamental bodies, sizes of the fundamental bodies, heights of the fundamental bodies, grain size distributions in at least one point within the fundamental bodies, bedding types in at least one point
5 within the fundamental bodies, degrees of erosional scour below the fundamental bodies associated with deposition of the fundamental bodies, shape of a channel feeding sediment to an inlet, size of the a channel feeding sediment to the inlet, degree of erosional scour caused by a channel feeding sediment to the inlet, at least one property of sediment which forms the channel feeding sediment to the inlet, at least
10 one property of sediment which subsequently fills the channel feeding sediment to the inlet, and any combination thereof.

5. The method of claim 1, wherein the at least the partial outline of the composite sedimentary body is determined from seismic data.

6. The method of claim 1, wherein the properties of at least one of the
15 fundamental bodies are determined using grain size and body thickness measurements from a well sample.

7. The method of claim 1, wherein the properties of at least one of the fundamental bodies are determined by using at least part of an outline form of an identified fundamental body.

20 8. The method of claim 1, wherein characterizing the properties of the fundamental bodies throughout the composite sedimentary body includes at least determining properties of fundamental bodies from the partial outline of the composite sedimentary body.

9. The method of claim 2, wherein a possible range of the inlet flow properties is
25 constrained by mathematical relationships between at least two of the local inlet properties.

10. A method for predicting the properties of a composite sedimentary body in a subsurface reservoir, comprising:

- (a) determining at least a partial outline of the composite sedimentary body;
- (b) determining at least a partial outline of at least one identified fundamental body within the composite sedimentary body;
- 5 (c) determining properties of at least one identified fundamental body within the composite sedimentary body;
- (d) characterizing the properties of fundamental bodies in the composite sedimentary body;
- 10 (e) generating another fundamental body to be placed in the partial outline of the composite sedimentary body;
- (f) placing the other fundamental body into the partial outline of the composite sedimentary body;
- 15 (g) repeating steps (e) through (f) until the partial outline of the composite sedimentary body is substantially full of fundamental bodies.

11. The method of claim 10, wherein the properties of the fundamental bodies are characterized by a method selected from the group consisting of: determining local inlet properties of flows which built the fundamental bodies, determining trends in the local inlet properties of flows which built the fundamental bodies, determining statistical distributions of the local inlet properties of flows which built the fundamental bodies, and any combination thereof.

12. The method of claim 11, wherein the local inlet properties are chosen from the group consisting of: flow velocity at an inlet, flow height at the inlet, suspended sediment volume within at least one grain size range at the inlet, inlet width, flow duration, inlet location, order in which the inlet is active relative to local inlets of other fundamental bodies, and any combination thereof.

13. The method of claim 10, wherein the properties of the fundamental bodies comprise at least one member of the group: shapes of the fundamental bodies, sizes of

the fundamental bodies, heights of the fundamental bodies, grain size distributions in at least one point within the fundamental bodies, bedding types in at least one point within the fundamental bodies, degrees of erosional scour below the fundamental bodies associated with deposition of the fundamental bodies, shape of the channel

5 feeding sediment to an inlet, size of the channel feeding sediment to the inlet, degree of erosional scour caused by the channel feeding sediment to the inlet, at least one property of sediment which forms the channel feeding sediment to the inlet, at least one property of sediment which subsequently fills the channel feeding sediment to the inlet, and any combination thereof.

10 14. The method of claim 10, wherein the at least the partial outline of the composite sedimentary body is determined from seismic data.

15. The method of claim 10, wherein the at least the partial outline of at least one identified fundamental body is determined from seismic data.

16. The method of claim 11, wherein a possible range of the local inlet properties

15 is constrained by mathematical relationships between at least two of the local inlet properties.

17. A method for predicting properties of a subsurface reservoir which is a composite sedimentary body in a subsurface reservoir, comprising:

20 (a) determining at least a partial outline of the composite sedimentary body;

(b) measuring thickness and grain size distribution at one point in at least one identified fundamental body within the partial outline of the composite sedimentary body;

(c) determining properties of the at least one identified fundamental body

25 within the composite sedimentary body from a point measurement of thickness and grain size distribution within the at least one identified fundamental body;

(d) characterizing properties of fundamental bodies throughout the composite sedimentary body;

(e) generating a another fundamental body to be placed in the partial outline of the composite sedimentary body;

5 (f) placing the other fundamental body into the partial outline of the composite sedimentary body;

(g) repeating steps (e) through (f) until the partial outline of the composite sedimentary body is substantially full of fundamental bodies.

18. The method of claim 17, wherein the properties of the fundamental bodies are
10 characterized by a method selected from the group consisting of: determining local inlet properties of flows which built the fundamental bodies, determining trends in the local inlet properties of the flows which built the fundamental bodies, determining statistical distributions of the local inlet properties of the flows which built the fundamental bodies, and any combination thereof.

15 19. The method of claim 18, wherein the local inlet properties are chosen from the group consisting of: flow velocity at an inlet, flow height at the inlet, suspended sediment volume within at least one grain size range, inlet width, flow duration, inlet location, order in which the inlet is active relative to local inlets of other fundamental bodies, and any combination thereof.

20 20. The method of claim 17, wherein the properties of the fundamental bodies comprise at least one member of the group: shapes of the fundamental bodies, sizes of the fundamental bodies, heights of the fundamental bodies, grain size distributions in at least one point within the fundamental bodies, bedding types in at least one point within the fundamental bodies, degrees of erosional scour below the fundamental
25 bodies associated with deposition of the fundamental bodies, shape of a channel feeding sediment to a inlet, size of the channel feeding sediment to the inlet, degree of erosional scour caused by the channel feeding sediment to the inlet, at least one property of sediment which forms the channel feeding sediment to the inlet, at least

one property of sediment which subsequently fills the channel feeding sediment to the inlet, and any combination thereof.

21. The method of claim 17, wherein the at least the partial outline of the composite sedimentary body is determined from seismic data.

5 22. The method of claim 17, wherein the properties of the fundamental bodies are determined by using at least the partial outline of the composite sedimentary body.

23. The method of claim 18, wherein a possible range of the local inlet properties is constrained by mathematical relationships between at least two of the local inlet properties.